State of California Business Transportation and Housing Agency

Memorandum

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File:

From: DEPARTMENT OF TRANSPORTATION
DIVISION of ENGINEERING SERVICES
Structure Design – Mail Station 9 4/11G

Subject: Site Seismicity Guidelines for Existing and Temporary Bridges

Attached are guidelines for the seismic review and analysis of existing and temporary structures. Memo to Designers 9-3 requires that when widening a bridge, the existing structure be evaluated, and upgraded if necessary, to meet current seismic retrofit standards and performance goals. Similar evaluations may be required when other bridge modifications are being designed.

If the designer deems that an existing structure is seismically vulnerable, a retrofit Strategy Meeting should be held. Attendees at the Strategy Meeting should include representatives from Structure Design, Earthquake Engineering, Geotechnical Earthquake Engineering, and Maintenance and Investigations. A representative from the District and Structures Project Management should be invited.

The purpose of the Strategy Meeting is to determine if seismic retrofitting is required. The proposed strategy must meet the Caltrans "no collapse" seismic retrofit and performance criteria without incurring unnecessary design and construction costs. If the results of the Strategy Meeting conclude that seismic retrofit of an existing structure is required, the responsible Office Chief will provide direction on the appropriate course of action.

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Attachments

SITE SEISMICITY GUIDELINES FOR EXISTING AND TEMPORARY BRIDGES

Approved by
The Executive Earthquake Committee
December 2001

There are many issues to be considered with regard to site seismicity including deterministic and probabilistic seismic events, attenuation methods, near fault influences, performance goals, ductility, etc. This document has been composed to standardize site seismicity procedures for existing ordinary structures. Project specific site seismicity recommendations shall be determined for "Important" bridges.

Bridge site seismicity criteria are determined by a number of conditions including:

Earthquake magnitude	Distance to fault
Soil type	Fault type
Post-earthquake performance	Original design standards
Exception categories	

With consideration for these conditions, a seismic review and analysis shall be performed in accordance with the following guidelines:

EXISTING ORDINARY BRIDGES

Minor Modifications:

Existing Ordinary Bridge for which:

- no substructure modifications are required
- mass is not increased by greater than 10% due to the modification
- fixity conditions are not modified
- ground motions have not changed since the bridge was screened as part of the Phase II Seismic Retrofit Program, or since a comprehensive seismic retrofit was performed

Neither a seismic review nor seismic analysis is required. However designers should assess the seismic demands created by the modifications on local components (e.g. assess seismic demands on overhangs when adding soundwall to a bridge).

Widenings and Other Major Modifications:

For existing bridges associated with widenings or other modifications not meeting the criteria for minor modifications listed above:

1. Existing Ordinary Bridge Not Previously Retrofitted[1]:
   - Perform seismic review including the review of As-Built details and geotechnical data.
   - If the review is inconclusive, perform seismic analysis using standard deterministic methods, as outlined in the Caltrans Seismic Design Criteria (SDC) Section 6.1.

[1] "Previously Retrofitted" refers to bridges which have never received a comprehensive total bridge retrofit, although they may have received a superstructure retrofit (i.e. restrainers, keys, seat extenders, etc).

- Present results of seismic analysis at a Strategy Meeting

2. Existing Ordinary Bridge Previously Retrofitted[1] or Designed Post-1990:
   - Perform seismic review including the review of As-Built details and geotechnical data.
   - If the review is inconclusive, perform seismic analysis using standard deterministic methods, as outlined in the Caltrans Seismic Design Criteria (SDC) Section 6.1.
   - If deterministic methods indicate seismic retrofit is needed, investigate bridge performance using probabilistic ground motions based on a 20% probability of exceedance in 100 years to determine Safety Evaluation seismic demands, as approved by the responsible Office Chief.
   - Present results of seismic analysis at a Strategy Meeting

   Probabilistic ground motions as described above shall not be used to determine Safety Evaluation seismic demands for existing bridges on Life Line routes that are required to provide post-earthquake performance to meet emergency response needs. New bridges and widenings shall continue to be designed according to the provisions of the SDC using standard deterministic methods.

TEMPORARY OR STAGED NEW ORDINARY BRIDGES[2]:

Site seismicity shall be based on a probabilistic ground motion with a 10% probability of exceedence in:

- Twice the number of years that the temporary structure or condition is expected to exist
- But not less than 10 years.

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[1] "Previously Retrofitted" refers to bridges which have never received a comprehensive total bridge retrofit, although they may have received a superstructure retrofit (i.e. restrainers, keys, seat extenders, etc).

[2] For minimum lateral loads for haul roads, see the "Minimum Lateral Loads for Haul Roads" memo dated May 25, 2000.